

PCB Mass Loading
Purina B Tower
SIRB ID: DE-1264
Wilmington, Delaware



BrightFields, Inc.

Appendix 22-B

PURINA B TOWER WILMINGTON, DELAWARE

SIRB ID: DE-1264

GENERAL SITE INFORMATION

Site Name: Purina B Tower

SIRB ID Number: DE-1264

Site Location and Description: The Purina Tower B site consists of one tax parcel located just outside the City of Wilmington limits in New Castle County (06-152.001-001). The site was formerly the Ralston Purina Company, which manufactured domestic animal food. Three buildings remain on the property; the original concrete grain silos used by the Ralston Purina Company, an administration building, and a recently constructed masonry block truck garage. Currently the site is in use as a bus storage facility for the Brandywine School District.

Previous Site Uses: Between 1941 and 1944, the Ralston Purina Company, Inc. purchased the property, which consisted of four parcels in total. Prior to the purchase of the property by Purina, the site is suspected to have been a municipal landfill for the City of Wilmington.

Site Regulatory Status: This section briefly summarizes previous investigations performed on the site through the SIRB program. A current SIRB regulatory status is also included.

Brownfields Preliminary Assessment II (BPA) of the Purina Tower B

As part of this BPA, DNREC collected 17 soil samples from borings and from surface soil. All the soil samples were field screened in a DNREC mobile laboratory. Subsequently, three soil samples were chosen based on the screening results for laboratory analysis. Soil samples across the site exhibited elevated concentrations of both inorganics and organics. The primary constituents of concern across the site were PAHs, which were detected in all samples above the residential benchmarks. In addition, sample SS-9 was reported to have concentrations of PAHs and Aroclor-1254 above both residential and commercial benchmarks.

In an effort to characterize site groundwater, two wells were installed and sampled. Samples were sent to STL-Envirotech Laboratory, Edison, New Jersey to be analyzed for a full suite of parameters. The results indicated that there were elevated concentrations of iron within site groundwater above the Drinking Water and United States Environmental Protection Agency (EPA) Maximum Contaminant Level (MCL) values.

Current Regulatory Status:

During the BPA conducted in 2002, DNREC came to the conclusion that the site should enter into the Voluntary Clean-up Program (VCP) to further evaluate the site conditions. The primary area of concern was surrounding the elevated concentrations of PCBs and PAHs reported in sample SS-9. As of September 2008, the current owners of the property had not entered into the VCP program. The site remains in the same condition as 2002.

SUMMARY OF SITE PCB INFORMATION

Site Investigation PCB Findings:

Total PCBs (Aroclor-1254 and Aroclor-1260) were detected in two surface samples at concentrations ranging from 0.74 mg/kg to 19.0 mg/kg. There were no PCBs reported from the confirmatory data in the subsurface soil.

Due to the insufficient number of distinct detections in the surface, BrightFields used the maximum detected value observed in the calculations performed for overland flow. There were no distinct detections observed in the subsurface saturated soils.

Concentrations of PCBs on Site			
Sample Matrix	Corresponding Figure	Analytical Methods	Range of Total PCBs
Surface Soil	Figure 2	Method 8082	Not detected to 19.0 mg/kg
Subsurface Soil (unsaturated)	Figure 3	Not Analyzed	Not Analyzed
Subsurface Soil (saturated)	Figure 4	Method 8082	Not detected
Ground Water	Figure 5	Method 8082	Not detected

A summary of all samples collected for PCBs are presented in the attached Tables 1 through 2.

Acreage where PCBs detected:

Total area of surface soil impacted by PCBs is 3.7 acres of which only 2.65 may be contributing to mass loading via overland flow. The remaining 1.05 acres of surface soil is currently under an impervious surface.

PCB Remediation Status:

There have been no remedial activities on site.

PCB MASS LOADING SUMMARY

PCB mass loading to surface water via groundwater transport was not estimated because PCBs were not detected in site groundwater or saturated soil. The PCB mass loading rate to surface water via overland flow was estimated for the Purina Tower "B" site. A summary of the results is included below and the details of the calculations are included as attachments to this Appendix.

OVERLAND FLOW:

Overland flow has been determined on this site by using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE predicts the long term average annual rate of erosion based on rainfall patterns, soil type, topography, cover/canopy factors and support management practices. These factors are site specific and rely on local information. A breakdown of the individual factors is presented below with a brief explanation of their choice.

Ground Cover and Canopy:

A site inspection was performed on November 11, 2008 to estimate the current site ground cover and canopy. The cover/management factor (C) assigned to the site and associated flow path is 0.034, which corresponds to areas of bare ground with a stone cover of at least five inches thick. Due to the limited access to the site (fenced), BrightFields interpreted surface cover based on aerial photography and perimeter observations.

Site Sediment and Erosion Control Practices:

There are no sediment and erosion controls in place.

Input Factors and Results:

A breakdown of the individual factors is presented below with a brief explanation of their choice.

Purina Tower "B"

RUSLE Factors	Values Provided	Explanation of Selection
R = rainfall-runoff erosivity index (10^2 ft-tonf-in/ac-hr)	170	An appropriate value for R for the site was determined from plots of Rainfall patterns for the Eastern U.S. (Wischmeier and Smith, 1978).
K = soil erodibility (0.01 tonf acre hr/acre ft-ton in)	0.28	The soil erodibility factor was chosen based on the information provided by the boring log represented for MWB-2 in the BPA II for Purina Tower "B" (DNREC 2002).
ls = topographic factor (dimensionless)	0.150	The slope length was estimated to 200 feet, which is the distance between the centroid and the closest surface body water along the overland flow path. The assumed slope (1.0 %) and slope length were used to calculate a topographic factor of 0.150 from the USGS windows based application.
C = cover/management factor (dimensionless)	0.034	The cover/management factor C assigned to the site by the USGS windows based application was 0.034, which corresponds to bare ground with stone cover at least five inches thick.
P = support practice factor (dimensionless)	1.0	There are currently no support practice factors being implemented on the Purina Tower "B" site.

The average annual erosion rate is based on the windows based RUSLE2 program (RUSLE2 License, version 2006-Jul-24).

The total PCB loading via overland flow is estimated to be 9.1 grams per year. Please see attached table for specific variables.

Uncertainty Evaluation

Specific Areas and Degree of Uncertainty for the Purina Tower "B" Site

	Samples Per Acre (site)	Chemical Data Quality*	Topography	Soil Type	Site Coverage	Map Quality	Distance to Discharge Points
Site Specific Information	0.5	Method 8082	Estimated based off a visual inspection	Logs that were located on-site.	Based on a limited site assessment.	Scaled Map	200 feet
Degree of Uncertainty	High	Moderate to High	High	Moderate	Moderate to High	Moderate	Moderate

* Primary analysis used in the historical samples

Elements of uncertainty for Purina Tower “B” site include the following: topography in the area is not well defined because the site falls just outside the City of Wilmington limits. PCB data was very limited on the site because screening data associated with the samples was not available in DNREC’s files. In the toxicological report issued by DNREC in 2002, there is mention that the screening analysis reported elevated concentrations of PCBs in the surface soils, but this could not be incorporated into our assessment. The sample location figures for the site were very limited and did not demonstrate the same nomenclature as the tables and analytical packages (e.g. SS-9 was unable to be found on sample location figure). BrightFields had to assume infer sample SS-9 matched with the boring location labeled PTB-9. Due to these evaluations the overall uncertainty associated with the Purina Tower “B” site is **moderate to high**.

Site References:

Department of Natural Resources and Environmental Control (DNREC), 2002, Toxicological Evaluation for the Purina Tower "B" Site, Wilmington, DE, September 2002.

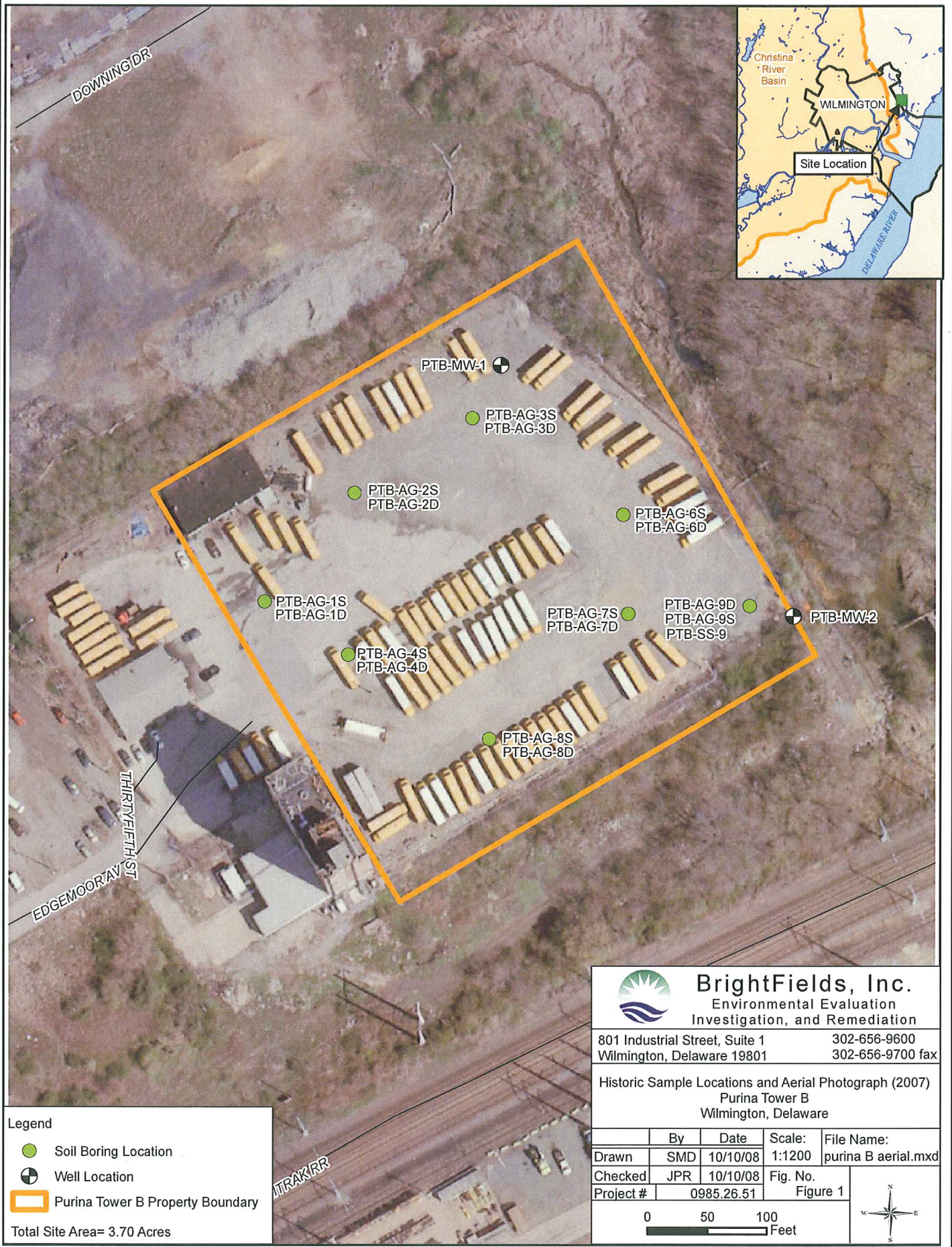
Department of Natural Resources and Environmental Control (DNREC), 2002, Brownfield Preliminary Investigation II of the Purina Tower "B" Site, July 2002.

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Figures



Legend

- Soil Boring Location
- ⊕ Well Location
- Purina Tower B Property Boundary

Total Site Area= 3.70 Acres



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Environmental Evaluation
Investigation, and Remediation

801 Industrial Street, Suite 1
Wilmington, Delaware 19801

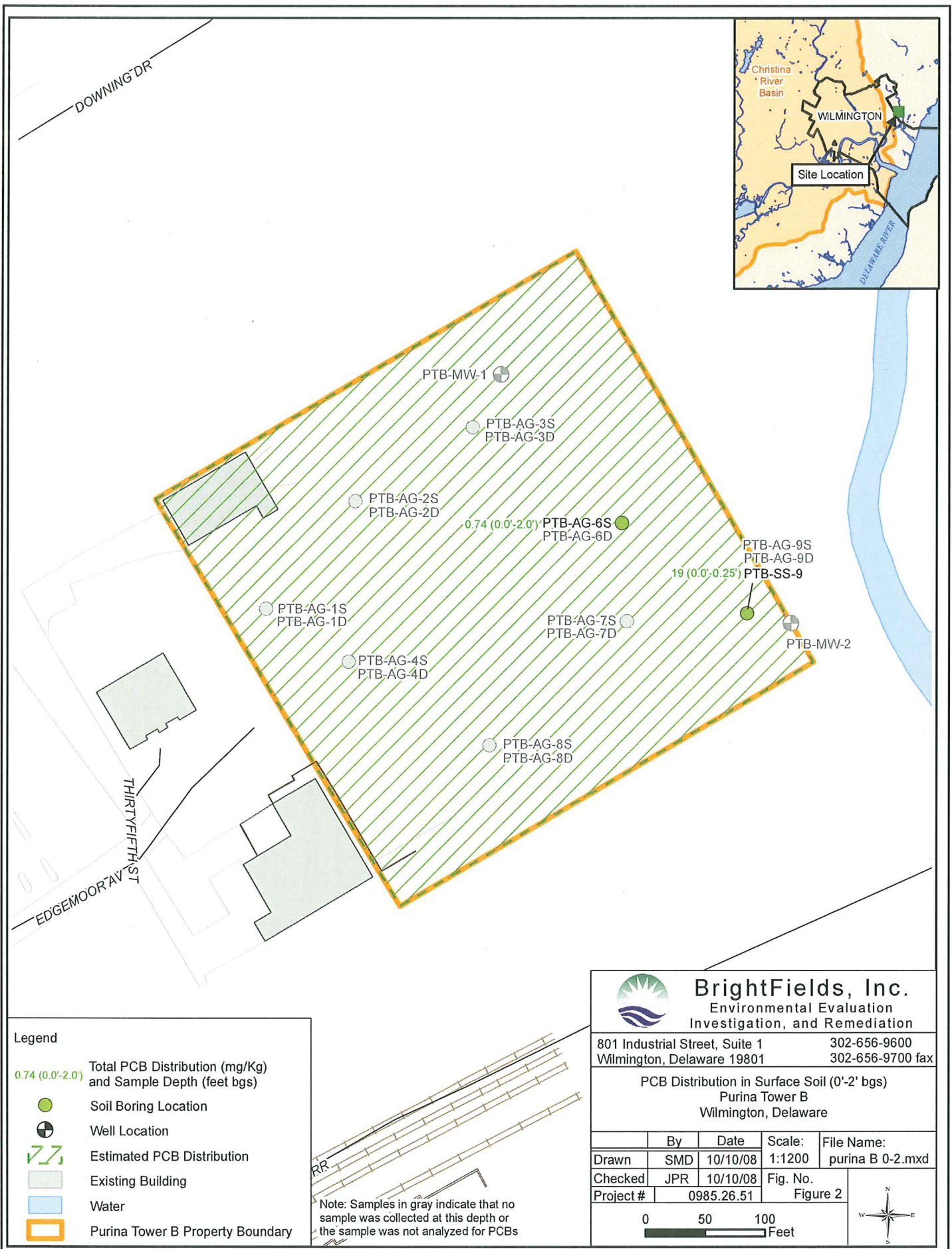
302-656-9600
302-656-9700 fax

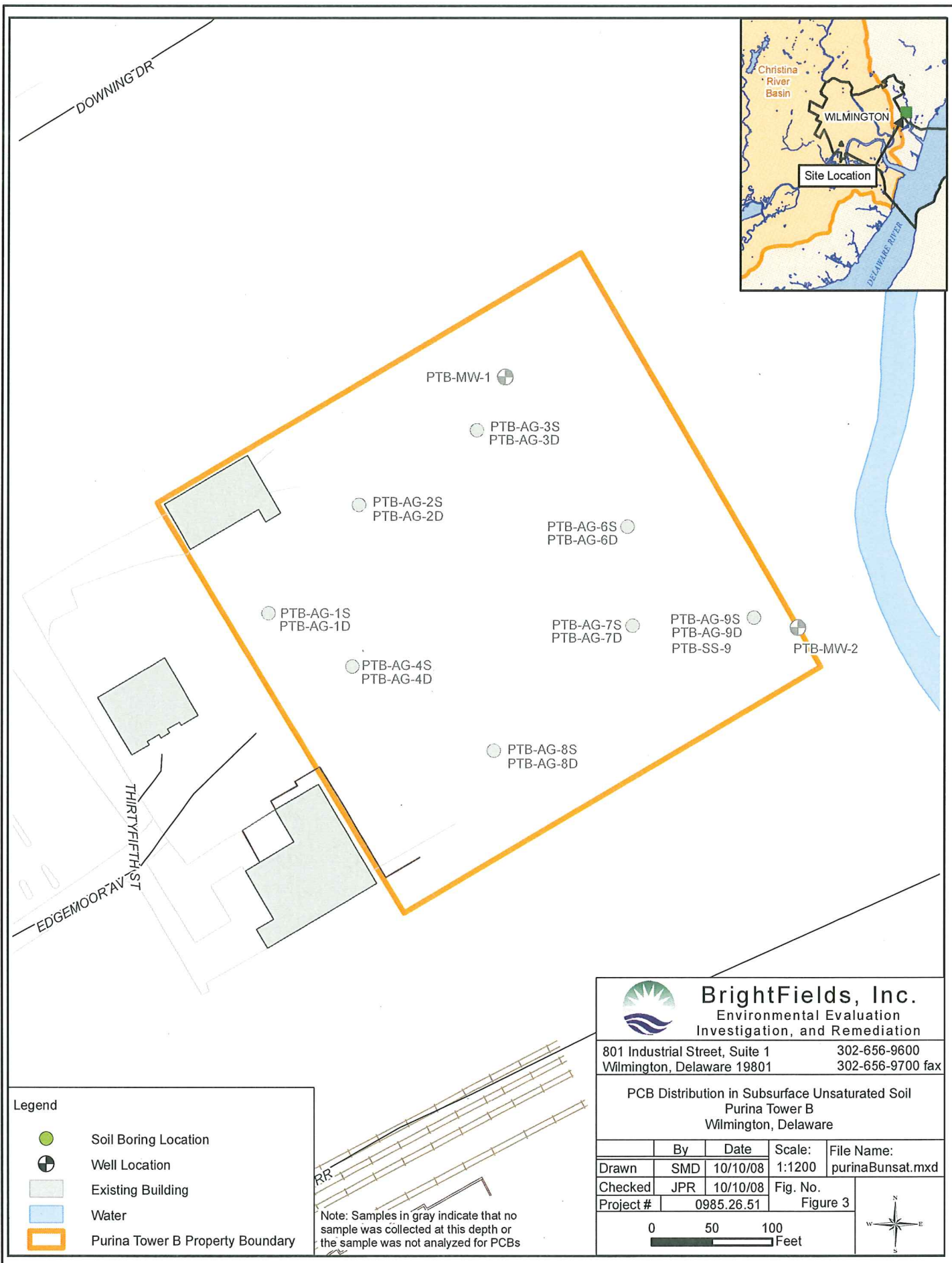
Historic Sample Locations and Aerial Photograph (2007)
Purina Tower B
Wilmington, Delaware

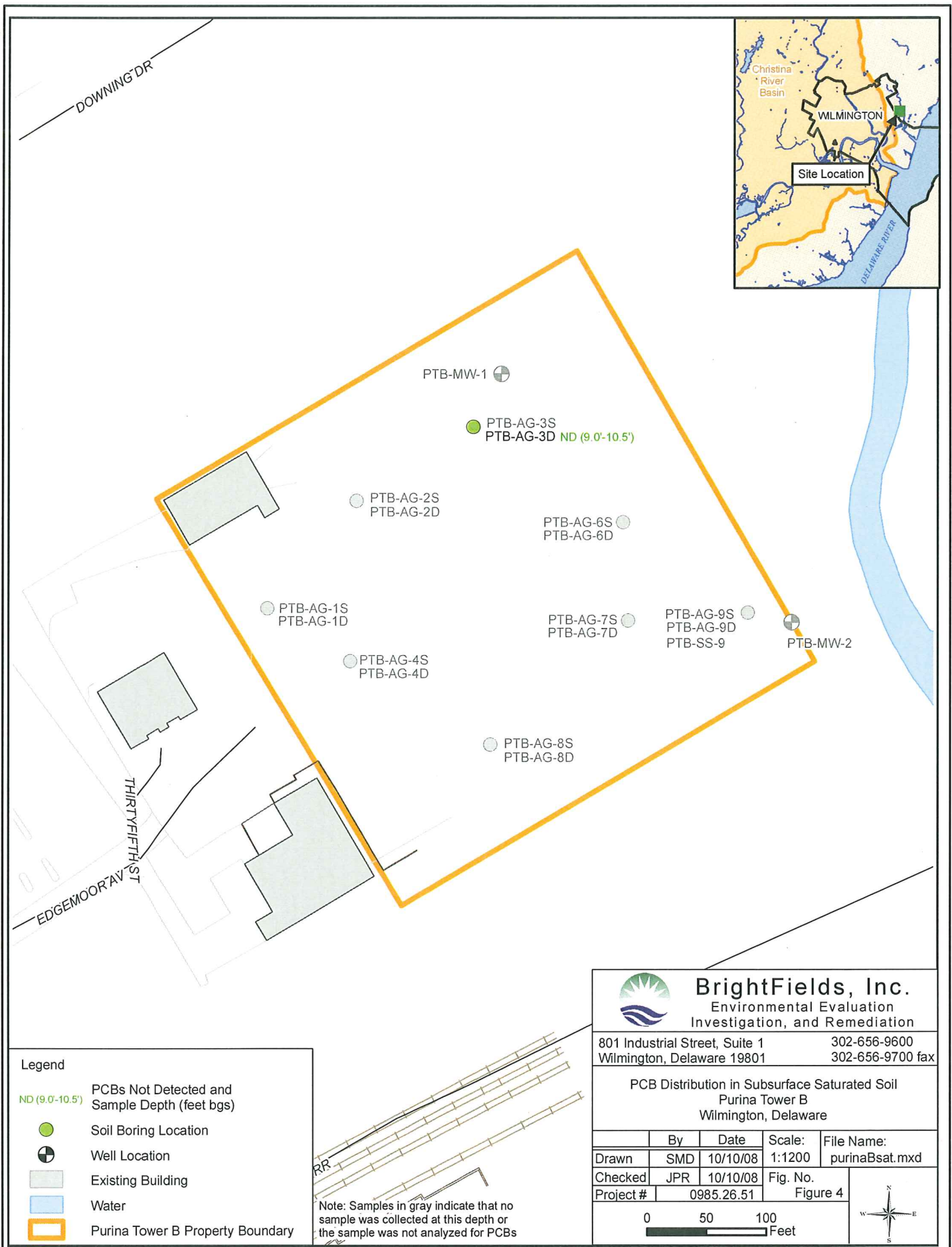
	By	Date	Scale:	File Name:
Drawn	SMD	10/10/08	1:1200	purina B aerial.mxd
Checked	JPR	10/10/08	Fig. No.	
Project #	0985.26.51		Figure 1	

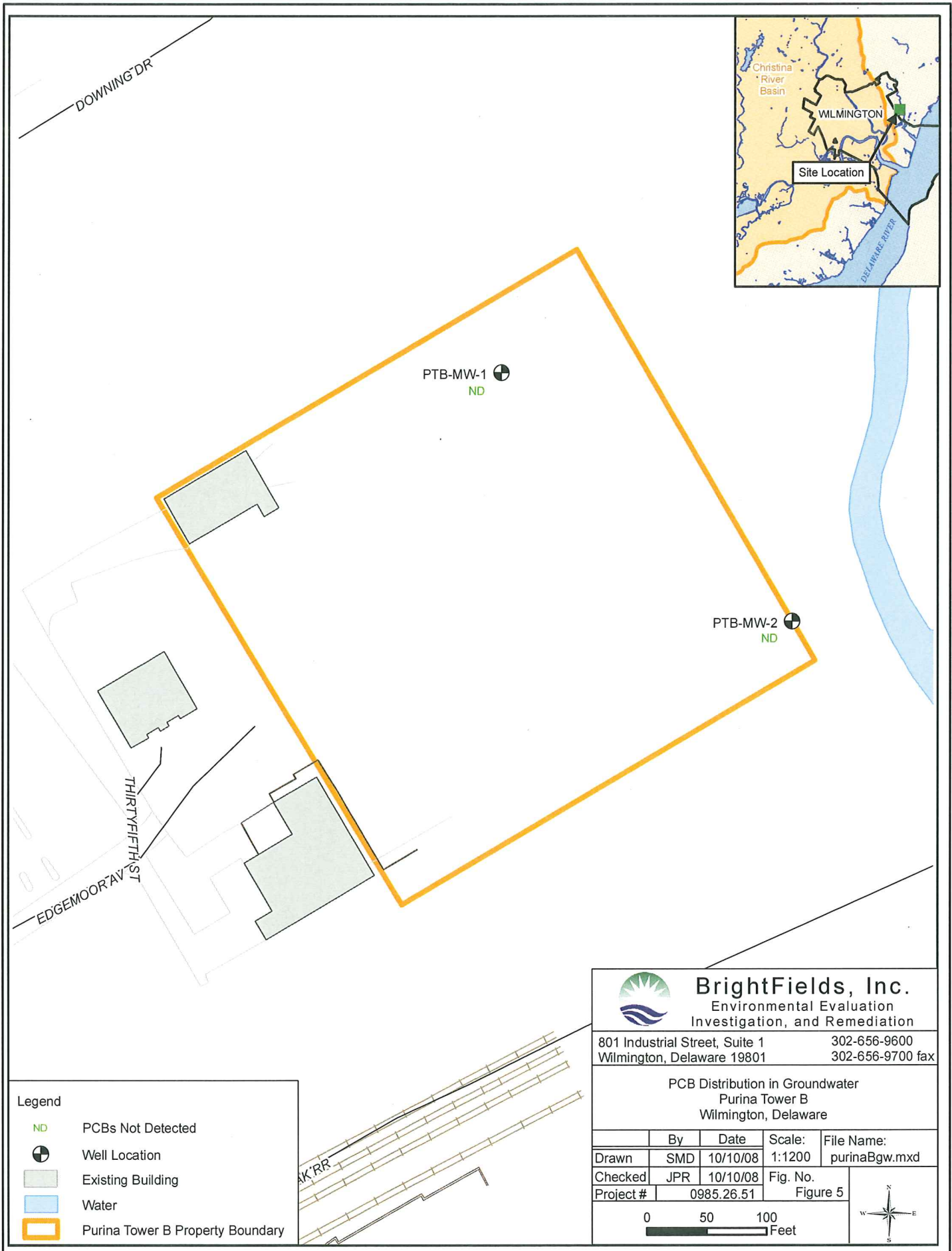
0 50 100
Feet











Legend

- ND PCBs Not Detected
- Well Location
- Existing Building
- Water
- Purina Tower B Property Boundary



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Environmental Evaluation
Investigation, and Remediation

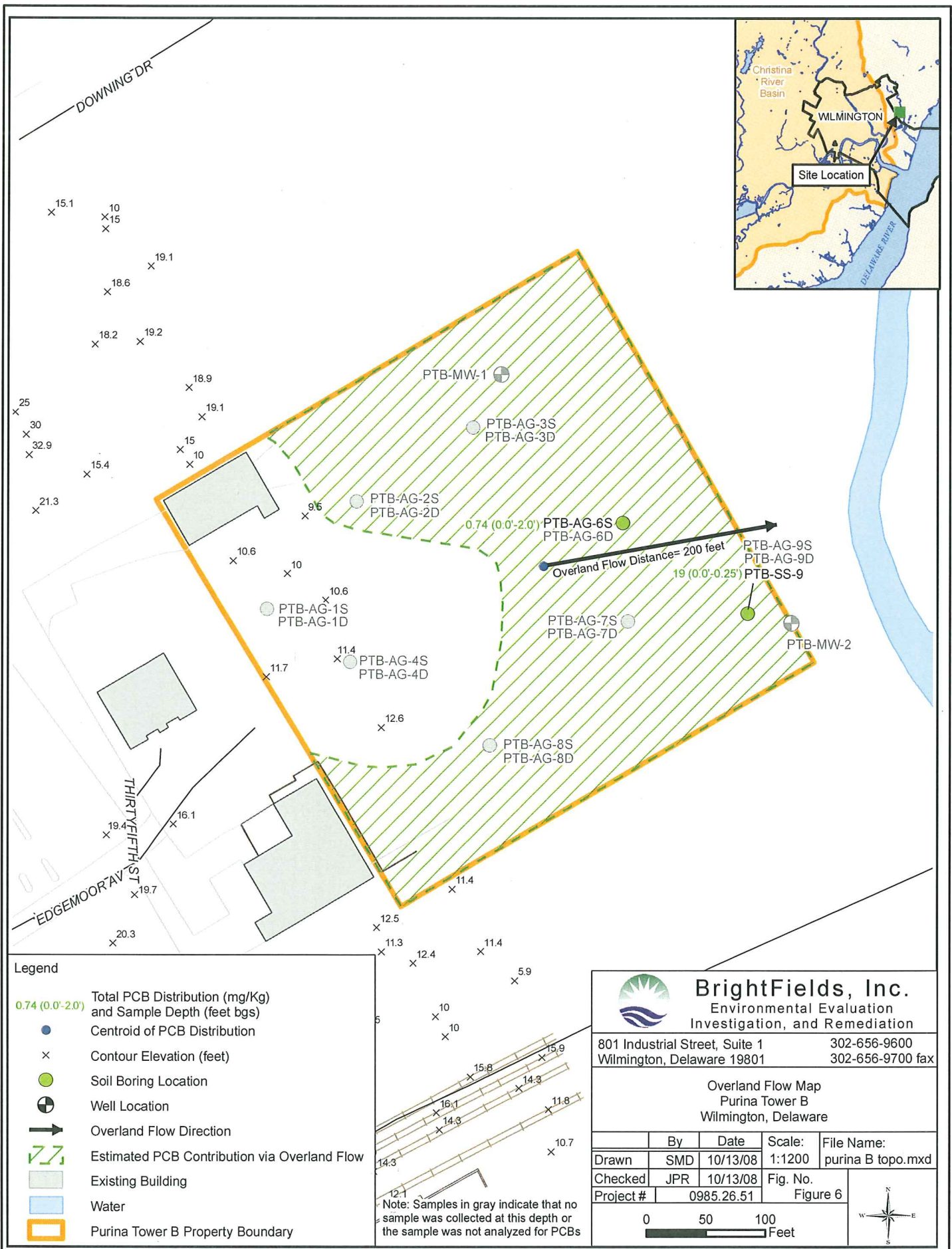
801 Industrial Street, Suite 1 302-656-9600
Wilmington, Delaware 19801 302-656-9700 fax

PCB Distribution in Groundwater Purina Tower B Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	10/10/08	1:1200	purinaBgw.mxd
Checked	JPR	10/10/08	Fig. No.	
Project #	0985.26.51		Figure 5	

0 50 100
Feet





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Tables

Table 1
PCB Analytical Results For Soil
Purina Tower "B" Property
Wilmington, DE
SIRB ID: DE-1103

Sample ID Sampling Depth (feet bgs) Sampling Date Units Report Issued	DNREC URS for Protection of Human Health Non-critical Water Resource Area mg/Kg		PTB-SS-9 0.0'-0.25' 4/18/2002 mg/Kg DNREC (2002)	PTB-AG-3D 9.0'-10.5' 4/18/2002 mg/Kg DNREC (2002)	PTB-AG-6S 0.0'-2.0' 4/18/2002 mg/Kg DNREC (2002)
	Unrestricted Use	Restricted Use			
	PCBs				
Aroclor-1016	5	82	1.8 U	0.14 U	0.078 U
Aroclor-1221	0.3	3	1.8 U	0.14 U	0.078 U
Aroclor-1232	0.3	3	1.8 U	0.14 U	0.078 U
Aroclor-1242	0.3	3	1.8 U	0.14 U	0.078 U
Aroclor-1248	0.3	3	1.8 U	0.14 U	0.078 U
Aroclor-1254	0.3	3	1.8 U	0.14 U	0.078 U
Aroclor-1260	0.3	3	19	0.14 U	0.41
Aroclor-1262	nca	nca	1.8 U	0.14 U	0.33
Aroclor-1268	nca	nca	1.8 U	0.14 U	0.078 U
			1.8 U	0.14 U	0.078 U

DNREC (2002) - Brownfield Preliminary Assessment II of Purina Tower
"B" (July 2002).

Qualifiers

U - The compound was not detected above the indicated laboratory detection limit

NR - Not analyzed

ND - Not Detected, but reporting limit could not be found for sample

nca - no criteria available

bold - concentration is above DNREC URS unrestricted use criteria

shaded - concentration is above DNREC URS restricted use criteria

Table 2
PCB Analytical Results For Groundwater
Purina Tower "B" Property
Wilmington, DE
SIRB ID: DE-1103

Sample ID Sampling Date Units Report Issued	DNREC URS for Protection of Human Health ug/L	PTB-MW-2 5/1/2002 ug/L DNREC (2002)	PTB-MW-1 5/1/2002 ug/L DNREC (2002)
PCBs			
Aroclor-1016	0.1	0.5 U	0.5 U
Aroclor-1221	0.03	0.5 U	0.5 U
Aroclor-1232	0.03	0.5 U	0.5 U
Aroclor-1242	0.03	0.5 U	0.5 U
Aroclor-1248	0.03	0.5 U	0.5 U
Aroclor-1254	0.03	0.5 U	0.5 U
Aroclor-1260	0.03	0.5 U	0.5 U
Aroclor-1262	nca	0.5 U	0.5 U
Aroclor-1268	nca	0.5 U	0.5 U

DNREC (2002) - Brownfield Preliminary Assessment II of the Purina "B" Tower
(July 2002).

Qualifiers

U - The compound was not detected above the indicated laboratory detection limit

NR - Not analyzed

nca - no criteria available

bold - concentration is above DNREC URS unrestricted use criteria

shaded - concentration is above DNREC URS restricted use criteria

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Site Photographs



**PCB Mass Loading Evaluation
Purina Tower "B"**



Entrance of Purina Tower "B" with asphalt surface cover.



Transition into stone cover for back portion of property.



**PCB Mass Loading Evaluation
Purina Tower "B"**



Stone matrix observed on site.



Observed slope heading towards tree line on back portion of the site.

PCB Mass Loading
Purina B Tower
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Wilmington, Delaware



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Overland Flow Calculations

PCB Loading Calculations from the Universal Soil Loss Equation
Purina Tower "B"
Wilmington, DE
DE-1264

Surface PCB Concentration 19 mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10 ² ft-tonf in/acre hr
K	Soil Erodibility	0.28	0.01 tonf acre hr/ac ft-ton in
	Estimated Slope Length	200	Feet
	Estimated Elevation Difference	2	Feet
	Slope	1.00	Percent
	Erodeable Area	2.65	Acres
LS	Topographic Factor	0.150	Dimensionless
C	Cover and Management Factor	0.034	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	0.20	ton/ac/yr

PCB Loading via Overland
Flow 9.14 grams/year - PCBs

Purina B Overland Flow Calculations

Location

USA\Delaware\New Castle County

Add break

Erase break

Manage

Soil

Topo

0.

1.

2.

0.

50.

100.

150.

200.

ft

Avg. slope steepness, %

1.0

Slope length (horiz), ft

200

Crit. slope length, ft

Detachment on slope, t/ac/yr

0.20

Soil loss erod. portion, t/ac/yr

0.20

Sediment delivery, t/ac/yr

0.20

Soil loss for cons. plan, t/ac/yr

0.20

T value, t/ac/yr

3.0

Fuel type for entire run

(none)

Energy use for entire simulation, gal/ac

0

Fuel cost for entire simulation, US\$/ac

0

Energy use for entire simulation, BTU/ac

0

Net C factor

0.034

Net LS factor

0.15

Net K factor

0.28

Net contour factor

1.0

Net ridge factor

1.0

Net ponding factor

0.84

Rock cover, %

100

Adjust rock cover

open

General yield level

Set by user

Surf. res. cov. values

Set by user

Adjust res. burial level

Normal res. burial

Soil conditioning index

open

Align of opert on segments

General composite segment info

Biomass by layer

Biomass summary

C subfactor by day

C subfactor by period

C subfactor by operation

Ridges_contour by day

Erosion by day

Erosion by period

Erosion by operation

Extra C, L, crit. length values

Hydrology

Management output by day

Management output by period

Residue values

Roughness

STRIPS_AND_BARRIERS

MANAGEMENT_STRIP_BUILDER

Runoff / Sediment overall results

Runoff / Sediment results by day

Sediment results by flow path

Sediment by segment

Sediment by segment by day

Soil output by day

Yield values

Info

Soil

MISC_CALCULATIONS1

Topography

Management

Strips / Barriers

Irrigation / Subsurface drainage

Diversion/terrace, sediment basin

Segment

+

-

1

Generic Soils\sandy clay loam (mod-high OM)

Seg length (horiz), ft

200

Soil loss, t/ac/yr

0.20

Sed. del., t/ac/yr

0.20

Consolidatio n time, yr

7



Groundwater Transport Calculations

(Not Applicable)